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REMARKS

The claims as originally presented are believed allowable and therefore remain in the application without amendment. New claims 13 - 16 are presented. New claims 13-16 are directed to circuits and methods wherein the signal specifically comprises brightness value samples.

35 U.S.C. 103(a)

The office action rejected Claims 1-12 under 35 U.S.C. 103(a) as being unpatentable over Okada et al. (U.S. 5,247,169) in view of Carlson (U.S. 4,523,230), and further in view of Deering et al. (U.S. Patent Publication 2003/0142099).

I. Okada

Okada fails to teach dividing a signal

Regarding independent claims 1 and 9, and for **claims 10-12**, the office action states, "Okada teaches a means for dividing an input signal into a plurality of signals having at least a high brightness signal and a low brightness signal." The office action cites Okada column 2, lines 17-33 as providing this teaching.

Applicant respectfully disagrees for the following reason. Okada fails to teach dividing a signal. Okada teaches only dividing light. Light is not signal according to Okada. Okada distinguishes the term "light" from the term "signal" in Okada's specification, for example, col. 2 lines 30-37.

"In this way, the quantities of the transmitted light from the high- and low-brightness parts of the object surface are equalized, and the image pick-up means simultaneously pick up the images of the high- and low-brightness parts of the object at the same positional relations and photoelectrically convert the images into electric image signals."

Applicant's use of the term "signal" in applicant's claims and in applicant's specification is consistent with the description of the term signal taught by Okada. Both are consistent with Applicant's arguments herein, and with understanding of those of ordinary skill in the art.

In applicant's specification on page 6, paragraph 1, lines 9-12, applicant describes an example "decomposer" and an example "input signal". "The decomposer 12 serves as an amplitude discriminator for the input signal which is preferably an eight bit video signal that preferably carries the desired brightness of one color component..."

The cited col. 2, lines 17-33 of Okada fail to teach or suggest any "means for dividing an input signal." Rather, Okada merely describes "means for dividing light" and a light dividing step. Please note applicant has highlighted portions of the cited text below relevant to applicant's remarks.

"In order to accomplish the objects and advantages mentioned above, the invention provides a method of and apparatus for picking up an image of the surface of an object, comprising a **light dividing step of and means for dividing light reflected by the object surface into two parts oriented in two directions**; a transmitted light quantity adjusting step of and means for transmitting the divided parts of the light through optical filters, respectively, each of the optical filters being set to a specific transmission light wavelength range so that the quantity of light reflected by a high-brightness part of the object surface and passed through a corresponding one of the optical filters is equal to the quantity of light reflected by a low-brightness part of the object surface and passed through the other optical filter; and an image pick-up step of and means for picking up an image from each of the divided parts of the light transmitted through the optical filters.

According to this arrangement, **light reflected by the object surface is divided by the light dividing means into two parts oriented in two directions**. Each of the divided parts of the light is transmitted through a corresponding one of the optical filters each being set to specific transmission light wavelength range. The transmission light wavelength ranges of the optical filters are set such that the quantity of the light that has been reflected by the high-brightness part of the object surface and transmitted through one of the optical filters is equal to that of the light that has been reflected by the low-brightness part of the object surface and transmitted through the other optical filter.

**In this way, the quantiles of the transmitted light from the high- and low-brightness parts of the object surface are equalized, and the image pick-up means simultaneously pick up the images of the high- and low-brightness parts of the object at the same positional relations and photoelectrically convert the images into electric image signals.**"

Okada fails to suggest, teach or imply that apparatus and methods useful for dividing light, i.e., optical apparatus, e.g. beamsplitters, can be used to divide signals, i.e., photoelectrically converted light. In fact, it is well known to those of ordinary skill in the art that methods and apparatus for dividing light (generally belonging to the "optics" arts) are not suitable for application to the task of dividing electric signals (apparatus and methods generally associated with the field of "electronics").

Okada fails to teach applicant's claimed "low pass filter"

The office action states Okada teaches a split low pass filter (10, 11) arrangement wherein the low-pass filters (10, 11) are for independently low pass filtering rising transients and falling transients in said low brightness signal to reduce adjacent pixel interdependence. Applicant respectfully disagrees for the following reason. The term "low pass filter" as recited in applicant's claims and defined in applicant's specification does not have the same meaning as the term "low pass filter" as the term is described by Okada. Applicant is entitled to the meaning of "low pass filter" consistent with the definition of that term in applicant's specification.

Applicant's claim term "low pass filter" is clearly defined in applicant's specification, for example in paragraph 19. Applicant's specification describes:

"A split low pass filter arrangement 25 in circuit 10 preferably comprises a low pass filter 19 preceded by a delay circuit 18 for acting on a dark going signal or transient to lengthen its fall time and comprises another low pass filter 20 that acts ahead of a bright going signal or transient to anticipate the transient and start the signal going bright earlier."

Therefore it is specifically stated in applicant's specification that a "low pass filter" refers to a circuit that acts on

a signal to adjust the time for transitions between bright and dark signals.

The term "low pass filter" as taught by Okada refers to a circuit that acts to remove noise components from analog signals. Specifically, Okada describes:

"CCD line image sensors 6 and 7 are arranged behind and close to the optical filters 4 and 5, respectively. A longitudinal side of each image sensor extends along a longitudinal side of the selected filter segment of the corresponding optical filter. The CCD line image sensors 6 and 7 pick up images from light transmitted through the selected filter segments of the optical filters 4 and 5, respectively. The CCD line image sensors 6 and 7 thus provide image signals A1 and B1 to amplifiers 8 and 9, which provide signals A2 and B2 respectively. Low-pass filters 10 and 11 remove noise components from the signals A2 and B2 and provide signals A3 and B3 respectively. A/D converters 12 and 13 convert the analog signals A3 and B3 into digital signals A4 and B4, respectively."

Because of this difference in terminology, Okada's lacks any teaching related to applicant's claimed "low-pass filter".

Okada fails to teach filtering "transients", e.g., "rising transients" and "falling transients".

Okada fails to teach filtering "transients", such as "rising transients" and "falling transients". The low pass filter of Okada is for removing noise. The term "transient" and "rising transients" and "falling transients" as recited in applicant's claims are defined in applicant's specification. This definition makes it clear to one of ordinary skill in the art that applicant's claimed "transient" is not noise; as the term noise is used by Okada.

Applicant describes the term "transients" in applicant's specification on page 6 lines 19-22. "One low pass filter acts on a **dark going signal, or transient**, to lengthen its fall time. Another low pass filter acts ahead of the delayed **bright going signal, or transient**...to start the signal going bright earlier."

Given applicant's definition of these terms, one of ordinary skill in the art would understand that "transients" are not noise. Applicant is entitled to be his own lexicographer. Therefore applicant is entitled to a meaning for the claim terms in accordance with applicant's definition.

Okada fails to teach filtering a low brightness signal

Okada teaches to employ low pass filters 10 and 11 for filtering noise from analog signals. Okada describes the operation of low pass filters 10 and 11 as filtering noise from the analog output of corresponding photosensors regardless of brightness of the signal output from the photosensor. Therefore, the teachings of Okada related to low pass filters 10, 11 would not have suggested to one of ordinary skill in the art applicant's claimed, "split low pass filter arrangement for independently low pass filtering rising transients and lengthening a fall time of falling transients in said low brightness signal to reduce adjacent pixel interdependence;"

In other words, Okada teaches a filter that remove noise from signal regardless of interpretation of any brightness information represented by the signal, i.e., whether or not the information is representational of low or high brightness. One of ordinary skill in the art would not be led by a mere teaching of a "low pass filter" to filter, separately from other signals, specifically those signals carrying representations interpretable as low brightness.

In summary, Okada lacks any teaching of "a split low pass filter arrangement for independently low pass filtering rising transients and lengthening a fall time of falling transients in said low brightness signal to reduce adjacent pixel interdependence".

II. Carlson

The office action states Carlson teaches "means for combining the delayed high brightness signal with the filtered low brightness signal to provide an output with reduced sparkle artifacts" by teaching how low-pass filters are coupled in a cascade through a summer wherein the first of the filters is associated with a lower subspectra and the second filter is associated with a higher subspectra (column 18, lines

29-49, figure 2a; see also column 8, lines 24-62, figure 2a) such that sparkle is suppressed (column 13, lines 4650).

Applicant respectfully disagrees for the following reasons. First, Carlton does not teach a summer combining a high brightness signal with a low brightness signal. Carlson's disclosure of a lower subspectra and a higher subspectra relates to "an input image-representing signal **defined in at least one dimension of the represented image by a spectrum of spatial frequencies.**" The subspectra of Carlson, therefore, refer to subspectra of the spectrum of spatial frequencies of an input image-representing signal. This is not a reference to low and high brightness signals as claimed by applicant.

Second, Carlson does not teach that coupling low pass filters with partial summers in cascade will have an effect on the artifact Carlson describes as "sparkle".

Carlson describes coring schemes applied to "an input image-representing signal **defined in at least one dimension of the represented image by a spectrum of spatial frequencies.**"

Carlson describes an effect he refers to as "sparkle" that results from certain applications of wide band coring schemes. The cited portion of Carlson describes:

An alternative technique would be to compare the absolute level of the input signal with the magnitude of the adjustable threshold and, if the absolute level of the input signal exceeds the magnitude of the threshold, all of the input signal would be passed to the L'.sub.K-1 output; otherwise, none of the input signal would be passed. This alternative technique has the advantage that appreciably more of the input signal power is retained in the output signal power. However, in wide-band coring schemes, a disadvantage of this alternative technique is that it tends to produce a high spatial frequency artifact known as "sparkle" in the displayed image derived from the output of such a coring means. However, an image processing system using narrow-band coring in accordance with the principles of the present invention the filtering after coring suppresses "sparkle", making this alternative technique more practical.

Carlson fails to teach the claimed result "reducing sparkle artifacts"

Applicant's claim term "sparkle" is used to denote a substantial increase in brightness in an image resulting from fringing fields. Fringing fields are uniquely associated with an LCOS display type. Applicant provides a definition of sparkle in applicants specification, paragraph 6:

"If adjacent pixels produce different brightness, then there must be a different potential on the 2 cell plates corresponding to the adjacent pixels. When potentials on adjacent cell plates are unequal, there is an electric field between them which is known as a fringing field. The fringing field has some components, which are orthogonal to the desired field. These orthogonal components are not a problem in the space between adjacent mirrors. But, the orthogonal components of the electric field, which is over the mirror, will have the effect of distorting the polarization rotation. This distortion results in a substantial local increase in brightness. This is a particular problem when the pixel is supposed to be dark, but is usually an insignificant problem when the pixels are intended to be bright since the pixels are not very different in voltage so the fringing field is not that great. Also, for dark pixels, the additional brightness is much more noticeable. Contrast ratio is also very important in making a high quality display. It is very important to achieve sufficient black level. A proportionately larger drive voltage is needed to create a slightly darker image in a normally white display. Often, a large difference in voltage between adjacent pixels is needed even if both pixels are low in brightness but not equal in brightness. This results in a major fringing field that produces a visible artifact denoted sparkle."

The term "sparkle" as described by Carlson denotes a "high spatial frequency artifact". **The sparkle described by Carlson is associated with wide band coring schemes as implemented in raster type displays.** Carlson describes:

"However, in wide-band coring schemes, a disadvantage of this alternative technique is that it tends to produce a high spatial frequency artifact known as "sparkle" in the displayed image derived from the output of such a coring means. However, an image processing system using narrow-band coring in accordance with the principles of the present invention the filtering after coring suppresses "sparkle", making this alternative technique more practical."

The office action correctly states Okada and Carlson do not teach how their circuits would reduce pixel interdependence in a liquid crystal display.

### III. Deering

The office action states Deering teaches an invention relating to the field of computer graphics in a display device

that may be of the liquid-crystalon-silicon type (page 1, para. 0002; page 4, para. 0056) wherein tri-linear filtering may be used to smooth out edges involving two neighboring mip maps, and this prevents moving objects from displaying a distracting 'sparkle' resulting from mismatched texture intersections (page 16, para. 0205).

Thus, the office action states it would have been obvious to a person of ordinary skill in the art to combine Okada, Carlson, and Deering because while the combination of Okada and Carlson teaches the concept of dividing an input signal into a plurality of signals having at least a high brightness signal and a low brightness signal and then combining the two signals, which have been lowpass filtered, with the use of a summer in order to facilitate sparkle suppression, Deering teaches how to reduce pixel interdependence in a liquid crystal display by the processing of smoothing out edges involving two neighboring mip maps.

Deering fails to teach how to reduce pixel interdependence

Deering fails to teach anything related to reducing adjacent pixel interdependence. The office action cited Deering page 16, para 0205 as teaching "distracting sparkle" resulting from mismatched texture intersections. However, this is not a teaching related to the phenomena of "sparkle" as it relates to "adjacent pixel interdependence" and as the term "sparkle" is defined by applicant. The sparkle phenomena associated with "adjacent pixel interdependence" is clearly defined in applicant's specification, paragraph 6.

"If adjacent pixels produce different brightness, then there must be a different potential on the 2 cell plates corresponding to the adjacent pixels. When potentials on adjacent cell plates are unequal, there is an electric field between them which is known as a fringing field. The fringing field has some components, which are orthogonal to the desired field. These orthogonal components are not a problem in the space between adjacent mirrors. But, the



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orthogonal components of the electric field, which is over the mirror, will have the effect of distorting the polarization rotation. This distortion results in a substantial local increase in brightness. This is a particular problem when the pixel is supposed to be dark, but is usually an insignificant problem when the pixels are intended to be bright since the pixels are not very different in voltage so the fringing field is not that great. Also, for dark pixels, the additional brightness is much more noticeable. Contrast ratio is also very important in making a high quality display. It is very important to achieve sufficient black level. A proportionately larger drive voltage is needed to create a slightly darker image in a normally white display. Often, a large difference in voltage between adjacent pixels is needed even if both pixels are low in brightness but not equal in brightness. This results in a major fringing field that produces a visible artifact denoted sparkle."

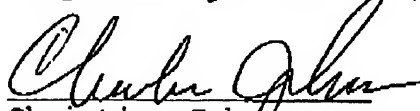
The office action failed to cite any portion of the Deering specification referring to adjacent pixel interdependence. The phenomena of sparkle in the context of adjacent pixel interdependence, and as defined by applicant, is unique to LCOS displays.

Deering specifically states that the teachings of Deering are applicable to display types other than LCOS displays, as well as LCOS displays. Therefore, the teachings of Deering cannot be directed to reducing a phenomenon exhibited only in LCOS displays.

Accordingly, Applicants respectfully request the withdrawal of the rejections under 35 U.S.C. § 103(a) and allowance of the claims 1-16.

Applicant invites the Examiner to call the undersigned if it is believed that a telephonic interview would clarify any issues raised herein.

Respectfully submitted,

  
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